

## 8.1 Climate and Meteorology

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Meteorological measurements are taken to support Hanford Site emergency preparedness and response, operations, and atmospheric dispersion calculations for dose assessments (Appendix E, Tables E.5 and E.7 through E.9). Support is provided through weather forecasting and maintenance and distribution of climatological data. Forecasting is provided to help manage weather-dependent operations. Climatological data are provided to help plan weather-dependent activities and are used as a resource to assess the environmental effects of site operations.

Local data to support the Hanford Meteorology Station operations are provided via the Hanford Meteorological Monitoring Network. This network consists of 30 remote monitoring stations that transmit data to the Hanford Meteorology Station via radio telemetry every 15 minutes. There are twenty-seven 9-meter (30-foot) towers and three 61-meter (200-foot) towers. Meteorological parameters collected at these stations include wind speed, wind direction, temperature, precipitation, atmospheric pressure, and relative humidity; however, not all parameters are collected at all stations. Figure 8.1.1 shows the 2000 wind roses (diagrams showing direction and frequencies of wind) measured at a height of 9 meters (30 feet) for the 30 meteorological monitoring stations on and around the Hanford Site.

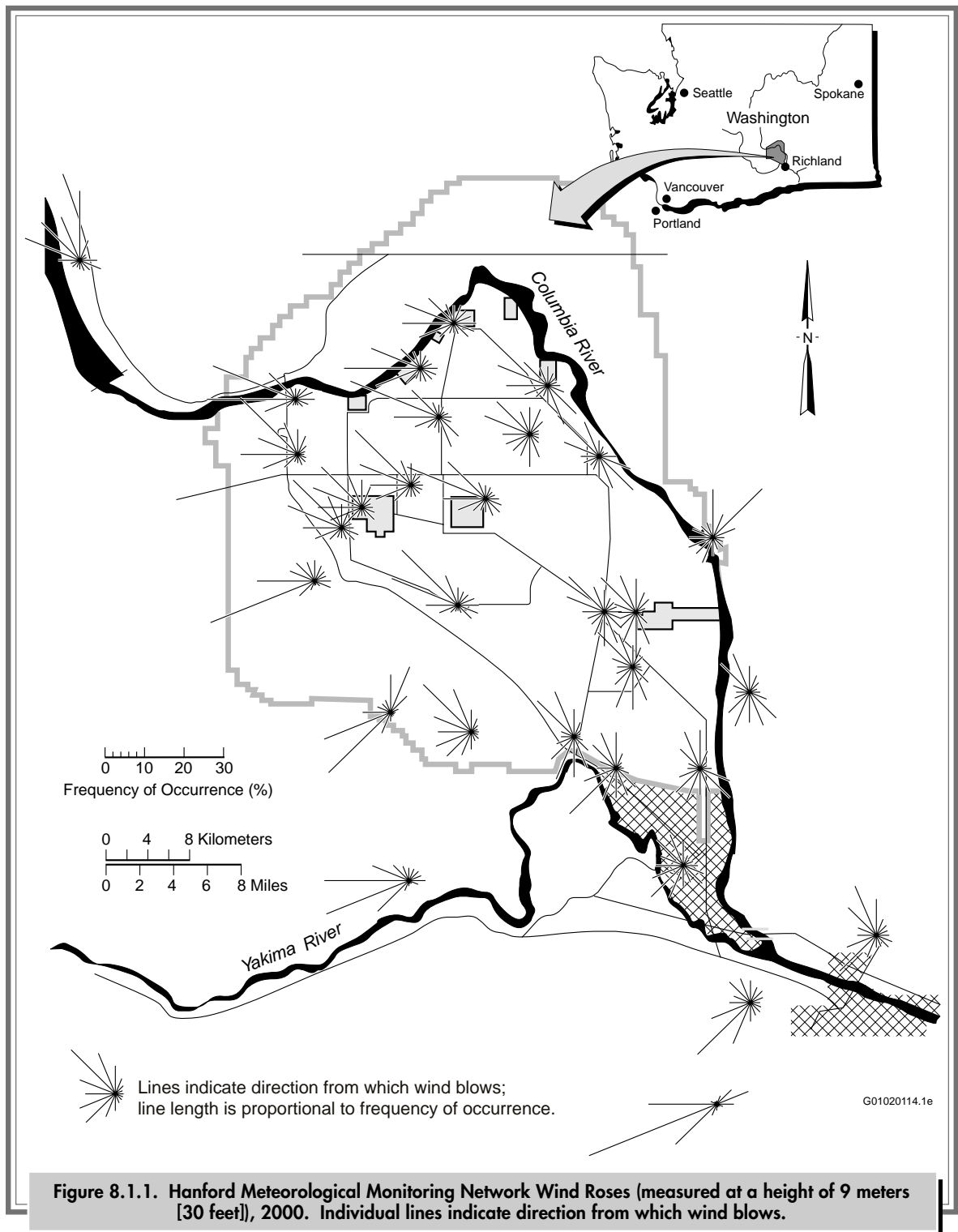
Real-time and historical data from the Hanford Meteorological Station can be obtained at <http://etd.pnl.gov:2080/HMS>. Data on this web site include hourly weather observations, 15-minute data from the Hanford Meteorological Monitoring Network, monthly climatological summaries, and historical data.



The Cascade Range, beyond Yakima to the west, greatly influences the climate of the Hanford Site by means of its rain shadow effect. The regional temperatures, precipitation, and winds are greatly affected by the presence of mountain barriers. The Rocky Mountains and ranges in southern British Columbia are effective in protecting the inland basin from the more severe cold polar air masses moving southward across Canada and winter storms associated with them.

The Hanford Meteorology Station is located on the 200 Areas plateau, where the prevailing wind direction is from the northwest during all months of the year. The secondary wind direction is from the southwest. Summaries of wind direction indicate that winds from the northwest quadrant occur most often during winter and summer. During spring and fall, the frequency of southwesterly winds increases, with a corresponding decrease in the northwesterly flow. Monthly average wind speeds are lowest during winter months, averaging about 3 meters per second (6 to 7 miles per hour), and highest during summer, averaging about 4 meters per second (8 to 9 miles per hour). Wind speeds that are well above average are usually associated with southwesterly winds. However, summertime drainage winds are generally northwesterly and frequently exceed 13 meters per second (30 miles per hour). These winds are most prevalent over the northern portion of the site.

Atmospheric dispersion is a function of wind speed, wind duration and direction, atmospheric stability, and mixing depth. Dispersion conditions are generally good if winds are moderate to strong, the atmosphere is of neutral or unstable stratification, and there is a deep mixing layer. Good



dispersion conditions associated with neutral and unstable stratification exist ~57% of the time during summer. Less favorable conditions may occur when wind speed is light and the mixing layer is shallow. These conditions are most common

during winter, when moderate to extremely stable stratification exists ~66% of the time. Occasionally, there are extended periods of poor dispersion conditions, primarily during winter, that are associated with stagnant air in stationary high-pressure systems.

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## 8.1.1 Historical Information

Daily and monthly averages and extremes of temperature, dew point temperature, and relative humidity for 1945 through 2000 are reported in PNNL-13469. From 1945 through 2000, the record maximum temperature was 45°C (113°F) recorded in August 1961, and the record minimum temperature was -30.6°C (-23°F) in February 1950. Normal monthly average temperatures ranged from a low of -0.4°C (31.3°F) in January to a high of 4.6°C (76.2°F) in July. During winter, the highest monthly average temperature at the Hanford Meteorology Station was 6.9°C (44.5°F) in February 1991, and the record lowest was -11.1°C (12.1°F) in January 1950. During summer, the record maximum monthly average temperature was 27.9°C (82.2°F) in July 1985, and the record

minimum was 17.2°C (63.0°F) in June 1953. The average annual relative humidity at the Hanford Meteorology Station is 54%. Humidity is highest during winter, averaging ~76%, and lowest during summer, averaging ~36%. Average annual precipitation at the Hanford Meteorology Station is 15.9 centimeters (6.26 inches). The wettest year on record, 1995, received 31 centimeters (12.3 inches) of precipitation; the driest, 1976, received 8 centimeters (2.99 inches). Most precipitation occurs during late autumn and winter, with more than half of the annual amount occurring from November through February. The snowiest winter on record, 1992-1993, received 142.5 centimeters (56.1 inches) of snow.

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## 8.1.2 Results of 2000 Monitoring

Calendar year 2000 was slightly cooler than normal and precipitation was above normal.

The average temperature for 2000 was 11.4°C (52.6°F), which was 0.4°C (0.7°F) below normal (11.8°C [53.3°F]). Three months during 2000 were warmer than normal, two months were nearly normal, and seven months were cooler than normal. April had the greatest positive departure, 1.5°C (2.7°F); and November, at 3.4°C (6.2°F) below normal, had the greatest negative departure.

Precipitation for 2000 totaled 20.5 centimeters (8.08 inches), 129% of normal (15.9 centimeters [6.26 inches]). Snowfall for 2000 totaled 41.9 centimeters (16.5 inches) (compared to an annual normal snowfall of 35.1 centimeters [13.8 inches]).

The average wind speed for 2000 was 3.4 meters per second (7.5 miles per hour) which was 0.1 meters per second (0.2 miles per hour) below normal. The peak gust for the year was 25 meters per second (55 miles per hour) on November 4.

There were two dust storms recorded at the Hanford Meteorology Station during 2000. There have been an average of five dust storms per year at the Hanford Meteorology Station during the entire period of record (1945-2000).

Table 8.1.1 provides monthly and annual climatological data from the Hanford Meteorology Station for 2000.



**Table 8.1.1. Monthly and Annual Climatological Data from the Hanford Meteorology Station, 2000**

Hanford Meteorology Station, 40 kilometers (25 miles) northwest of Richland, Washington,  
latitude 46° 34'N, longitude 119° 35'W, elevation 223 meters (733 feet)

Month	Temperatures, °C								Precipitation (cm)				Relative Humidity (%)		15-m Wind <sup>(a)</sup>				
	Averages				Extremes				Total	Departure <sup>(b)</sup>	Snowfall		Average	Departure <sup>(b)</sup>	Average Speed, m/s	Departure <sup>(b)</sup>	Peak Gusts		
	Daily Maximum	Daily Minimum	Monthly	Departure <sup>(b)</sup>	Highest	Date	Lowest	Date			Total	Departure <sup>(b)</sup>					Speed, m/s	Direction	Date
J	4.4	-3.4	0.5	+0.9	12.8	8 <sup>(c)</sup>	-7.8	30 <sup>(c)</sup>	2.8	+0.8	20.8	+10.9	79.7	+3.3	3.1	+0.2	23.7	SW	9
F	8.4	-0.9	3.8	+0.4	12.2	29	-6.1	25 <sup>(c)</sup>	2.8	+1.3	1.3	-3.8	77.1	+6.8	2.9	-0.3	14.8	SW	2
M	13.6	0.6	7.1	-0.5	20.0	31	-4.4	7	2.4	+1.2	0	-0.8	59.7	+3.8	3.3	-0.4	19.2	WSW	14
A	20.8	5.2	13.0	+1.5	27.8	12	-1.7	5	1.5	+0.4	0	- T <sup>(d)</sup>	48.3	+1.1	3.5	-0.5	19.2	WSW	4
M	23.6	8.9	16.2	-0.1	30.6	21 <sup>(c)</sup>	0.6	6	2.0	+0.7	0	0	44.2	+1.5	4.4	+0.4	22.8	WSW	9
J	29.1	13.0	21.1	+0.1	37.8	28	6.1	1	0.6	-0.3	0	0	39.0	+0.2	4.4	+0.3	19.7	W	14
J	33.1	15.3	24.2	-0.4	41.7	31	6.7	4	1.2	+0.7	0	0	35.7	+2.2	3.7	-0.2	19.7	NW	14
A	32.4	14.3	23.3	-0.6	40.0	9	9.4	19	T <sup>(d)</sup>	-0.7	0	0	33.7	-2.1	3.6	0	17.4	WNW	13
S	25.3	9.8	17.6	-1.2	33.3	14	0.0	23	1.4	+0.6	0	0	48.6	+5.9	3.4	0	20.6	W	8
O	17.7	4.7	11.2	-0.4	24.4	1	-1.1	22	1.4	+0.5	0	-0.3	61.8	+6.6	2.9	0	17.9	W	1
N	5.0	-2.8	1.1	-3.4	14.4	4	-7.8	15	2.7	+0.4	3.0	-1.5	79.5	+6.1	2.9	0	24.6	W	4
D	1.2	-3.8	-1.3	-0.9	9.4	17	-10.6	15 <sup>(c)</sup>	1.7	-0.9	16.8	+2.3	85.2	+4.9	2.3	-0.3	20.1	W	17
Y <sup>(e)</sup>	17.9	5.1	11.4	-0.4	41.7	Jul 31	-10.6	Dec 15 <sup>(c)</sup>	20.5	+4.6	41.9	+6.9	57.7	+3.4	3.4	-0.1	24.6	W	Nov 4

NOTE: See Appendix A, Table A.2 for unit conversion information.

(a) Measured on a tower 15 meters (50 feet) above the ground.

(b) Departure columns indicate positive or negative departure of meteorological parameters from 30-year (1961-1990) climatological normals.

(c) Latest of several occurrences.

(d) Trace.

(e) Yearly averages, extremes, and totals.

